

## Motor Vehicle Safety Winnable Battle • Summary of Key Publications

### Seat Belts & Child Passenger Safety

#### **Adult seat belt use: does the presence of children in the household make a difference?**

This article examines estimates of seat belt use among adults with and without at least one child in the household, and whether having at least one child in the household is associated with adult seat belt use. The Second Injury Control and Risk Survey (ICARIS-2) was used. National estimates were calculated for the prevalence of adult seat belt use and stratified according to the presence or absence of children in the household. Based on the 9,684 completed household interviews in ICARIS-2, an estimated 15.9% (13 million) of drivers with children in their households did not always wear their seat belt when driving, and 17.5% (15 million) of adult passengers with children in their households did not always wear their seat belt while riding. Drivers with children in the household, living in the Northeast, North Central, and Southern census regions of the country were significantly more likely than those in the West to report wearing their seat belt less than always. While seat belt use rates are increasing, many more lives could be saved by more complete restraint use. Effective strategies for increasing seat belt use rates and decreasing the number of both fatal and nonfatal motor vehicle injuries include primary enforcement laws, enhanced enforcement of seat belt use laws, and child safety-seat distribution combined with education programs.

**Publication:** Traffic Injury Prevention 2008;9(5):414-20

**Authors:** Boyd R, Kresnow MJ, Dellinger AM

#### **Associations between sociodemographics and safety belt use in states with and without primary enforcement laws**

This article examines how safety belt use is influenced by sociodemographic characteristics, primary enforcement laws (police may stop and ticket a motorist solely for being unbelted), and secondary enforcement laws (police may issue a safety belt citation only if the vehicle has been stopped for another reason). Authors analyzed 2002 Behavioral Risk Factor Surveillance System data from 50 states and the District of Columbia. Reported safety belt use was higher in states that had primary versus secondary enforcement laws, both overall and for each sociodemographic characteristic examined. Safety belt use was 85% in states that had primary enforcement laws and 74% in states that had secondary enforcement laws. Cross-sectional data suggested that primary enforcement laws may have the greatest effect on sociodemographic groups that reported lower levels of safety belt use. Primary enforcement laws are an effective population-based strategy for reducing disparities in safety belt use and may, therefore, reduce disparities in crash-related injuries and fatalities.

**Publication:** American Journal of Public Health 2007;97:1619-1624

**Authors:** Beck LF, Shults RA, Mack KA, Ryan GW

#### **Child passenger restraint use and emergency department-reported injuries: A special study using the National Electronic Injury Surveillance System-All Injury Program, 2004**

In 2004, more than 180,000 child passengers aged  $\leq 12$  years sought care in U.S. hospital emergency departments (EDs) for injuries sustained in motor-vehicle crashes (MVCs). The article expanded the National Electronic Injury Surveillance System-All Injury Program for 635 injured children aged  $\leq 12$  years treated at 15 hospital EDs in 2004 by collecting multiple injury diagnoses and interviewing parents about MVC circumstances. Nine percent of the children were unrestrained and 36% were inappropriately restrained. Blacks and Hispanics were about six times more likely to be unrestrained than Non-Hispanic Whites (12% and 14%, respectively, vs. 2%). Seventy-seven percent of inappropriate restraint use occurred among children aged 4-8 years, who were prematurely placed in seatbelts. Eight percent of children required hospitalization; unrestrained children were three times more likely to be hospitalized

than restrained children (21% vs. 7%). Age-appropriate restraint use should be promoted for child passengers, particularly among Blacks, Hispanics, and children riding in trucks.

**Publication:** Journal of Safety Research 2008;39:25-31

**Authors:** Lee KC, Shults RA, Greenspan AI, Haileyesus T, Dellinger AM

### **Evaluation of community-based programs to increase booster seat use**

This article reports the results of an evaluation of two community-based booster seat promotion programs in Michigan; one program focused on a low-income community, while the other focused on a Hispanic community. Each community received funding to develop and implement a booster seat intervention program specific to their community. To determine the effectiveness of each program, direct observation surveys of booster seat use were conducted in each community, as well as in similarly composed comparison communities, before and after program implementation. A process evaluation documented activities and provided additional information for interpreting the results of the direct observation survey. Target age children (4–8 years) were observed traveling in cars, vans/minivans, sport-utility vehicles, and pickup trucks in each community. Baseline booster seat use was  $19.0 \pm 5.3\%$  and  $9.7 \pm 2.5\%$  for the low-income and Hispanic program communities, respectively. Post program results showed no significant change for the low-income program community, and a significant increase within the Hispanic program community. The process evaluation revealed challenges for each program and suggestions to overcome those challenges.

**Publication:** Accident Analysis and Prevention 2008;40:295-302

**Authors:** St. Louis RM, Parow JI, Eby DW, Bingham CR, Hockanson HM, Greenspan AI

### **Geographic and sociodemographic variation in self-reported seat belt use in the United States**

Authors examined data on self-reported use of seat belts from 50 states, the District of Columbia, and three territories using the 2008 Behavioral Risk Factor Surveillance System, a state-based random-digit dialed telephone survey ( $n = 406,552$ ). Reported seat belt use was assessed by state, U.S. Census regions, and U.S. Department of Agriculture (USDA) rural/urban continuum codes. Overall, 85% of adults in the United States reported they always used seat belts. Regionally, the West had the highest prevalence of persons who reported that they always wear seat belts (89.6%) and the Midwest had the lowest (80.4%). States with primary seat belt laws had the highest prevalence of reported seat belt use, compared with states with secondary or no laws. After adjusting for various sociodemographic characteristics, body mass index, and type of seat belt law, persons in the most densely populated metropolitan areas were significantly more likely to report always wearing seat belts than those in most sparsely populated rural areas (adjusted odds ratio = 2.9). Our findings reinforce the evidence that primary enforcement seat belt laws are effective for increasing seat belt use, and suggest that upgrading to primary enforcement laws will be an important strategy for reducing crash-related fatalities in rural areas.

**Publication:** Accident Analysis and Prevention 2010;42:1066–1071

**Authors:** Strine TW, Beck LF, Bolen J, Okoro C, Dhingra S, Balluz L

### **Restraint use and seating position among children less than 13 years of age: Is it still a problem?**

Motor vehicle crashes are a leading cause of death among children. Age-appropriate restraint use reduces the risk of death due to a motor vehicle crash by 71% for infants and 54% for toddlers, ages 1-4 years. Use of booster seats reduces the risk of serious injury among children 4-7 years by 59% compared to the use of vehicle seat belts. In addition, rear seating position is associated with a 49% reduction in injury risk among children less than 13 years. With data obtained from a nationally representative random-digit-dial survey we estimated restraint use and seating position among children less than 13 years. Parents reported an estimated 6118,337 children who rode unrestrained and more than one million children who rode in the front seat of a vehicle at least some of the time in a 30 day

period. During that time close to 11 million children 8 years and younger reportedly used only vehicle seat belts. Our results highlight the need for continued outreach to parents regarding optimal restraint use and rear seating position for children every trip, every time.

**Publication:** Journal of Safety Research 2010;41:183-185

**Authors:** Greenspan AI, Chen J.

### **Seat belt use in states and territories with primary and secondary laws – United States, 2006**

Motor-vehicle crashes are a leading cause of death in the United States. In the event of a crash, seat belts are highly effective in preventing serious injury and death. Data from the 2006 Behavioral Risk Factor Surveillance System were used to calculate prevalence of seat belt use by state and territory and by type of state seat belt law (primary vs. secondary enforcement). In 2006, seat belt use among adults ranged from 58.3% to 91.9% in the states and territories. Seat belt use was 86.0% in states and territories with primary enforcement laws and 75.9% in states with secondary enforcement laws. Seat belt use continues to increase in the United States. Primary enforcement laws remain a more effective strategy than secondary enforcement laws in getting motor-vehicle occupants to wear their seat belts.

**Publication:** Journal of Safety Research 2009;40:469-472.

**Authors:** Beck LF, Shults RA

### **Short-term physical limitations in children following motor vehicle crashes**

This study is part of an ongoing, large-scale child-specific crash surveillance system in 15 states. Data were collected using claims records and parent/driver telephone surveys. Respondents were asked whether children sustained physical limitations from the crash and the length of time limitations persisted. Overall, 4.7% had  $\geq 1$  physical limitations. Limitations increased with age, from 1.1% for children  $\leq 3$  years to 8.4% for adolescents 13-15 years ( $p < .001$ ). Among children with AIS  $\geq 2$  injuries the proportion with physical limitations ranged from 47% to 96% depending on injury diagnosis. Among children with AIS 1 whiplash injuries, 48% resulted in physical limitations. After adjusting for driver characteristics and vehicle type, child's age, restraint use, and type of initial impact were independently associated with the presence of physical limitations. Our results show the importance of assessing for limitations following a motor vehicle crash. We also identified a group of children with minor whiplash injuries at risk for physical limitations.

**Publication:** Accident Analysis and Prevention 2008;40:1949-1954.

**Authors:** Greenspan AI, Kallan MJ

## **Alcohol-Impaired Driving**

### **Alcohol-impaired driving and children in the household**

More children in the United States are killed in motor vehicle crashes annually than by any other cause; nearly a quarter of these deaths involve alcohol. This study examines the national prevalence of alcohol-impaired driving and riding with an alcohol-impaired driver and the association of these behaviors to having at least 1 child in the household. An estimated 2.5 million adult drivers with children living in their households reported that they had been a recent alcohol-impaired driver. Evidence-based approaches, including mass media campaigns and sobriety checkpoints, continue to be critically important public health activities.

**Publication:** Family & Community Health 2009;32(2):167-74

**Authors:** Boyd R, Kresnow MJ, Dellinger AM

### **Driver- and passenger-based estimates of alcohol-impaired driving in the U.S., 2001-2003**

Alcohol-impaired driving (AID) continues to be a major public health problem in the U.S. The objective of this study was to estimate the number of annual driver- and passenger-reported episodes of AID and explore the effect of sociodemographic characteristics and drinking patterns on both behaviors. Data from a nationally representative random-digit-dial telephone survey of U.S. adults were analyzed in 2007. From July 23, 2001, to February 7, 2003, an estimated 7 million drivers reported 190 million annual episodes of AID, and an estimated 10.5 million passengers reported 290 million annual episodes of AID. A comparison of estimates from this survey to those from a similar survey conducted in 1994 shows that episodes of both driver- and passenger-reported AID have increased by slightly more than 50%. Multivariable analysis revealed several gender differences in risk factors for both driver- and passenger-reported AID. For example, being of Hispanic ethnicity and not always wearing a seat belt were both associated with an increased risk of AID episodes for men but not women. A strong association between binge drinking and both driver- and passenger-reported AID was found for both genders. Episodes of driver- and passenger-reported AID increased substantially between the middle 1990s and the early 2000s. The passenger estimates suggest that drivers may under-report AID by about 50%. Public health interventions to reduce AID should give equal consideration to impaired drivers and their passengers.

**Publication:** American Journal of Preventive Medicine 2009;36(6):515-22

**Authors:** Shults RA, Kresnow MJ, Lee KC

### **Effectiveness of ignition interlocks for preventing alcohol-impaired driving and alcohol-related crashes**

*In Press*

**Publication:** American Journal Preventive Medicine 2010 (in press)

**Authors:** Elder R, Voas R, Beirness D, Shults RA, Sleet DA, Nichols JL, et al

### **Effectiveness of multicomponent programs with community mobilization for reducing alcohol-impaired driving**

A systematic review was conducted to determine the effectiveness and economic efficiency of multicomponent programs with community mobilization for reducing alcohol-impaired driving. The review was conducted for the Guide to Community Preventive Services (Community Guide). Six studies of programs qualified for the review. Programs addressed a wide range of alcohol-related concerns in addition to alcohol-impaired driving. According to Community Guide rules of evidence, the studies reviewed provided strong evidence that carefully planned, well-executed multicomponent programs, when implemented in conjunction with community mobilization efforts, are effective in reducing alcohol-related crashes. Three studies reported economic evidence that suggests that such programs produce cost savings. The multicomponent programs generally included a combination of efforts to limit access to alcohol (particularly among youth), responsible beverage service training, sobriety checkpoints or other well-defined enforcement efforts, public education, and media advocacy designed to gain the support of both policymakers and the general public for reducing alcohol-impaired driving.

**Publication:** American Journal of Preventive Medicine 2009;37(4):360-71

**Authors:** Shults RA, Elder RW, Nichols JL, Sleet DA, Compton R, Chattopadhyay SK; Task Force on Community Preventive Services

### **Patterns of alcohol consumption and alcohol-impaired driving in the United States.**

Alcohol-related motor vehicle crashes kill approximately 17,000 Americans annually and were associated with more than \$51 billion in total costs in 2000. Relatively little is known about the drinking patterns of alcohol-impaired (AI) drivers in the United States. 2006 Behavioral Risk Factor Surveillance System (BRFSS) was analyzed for alcohol consumption and self-reported AI driving among U.S. adults aged > or =18 years for all states. Five percent of drinkers were engaged in AI driving during the past 30

days. Overall, 84% of AI drivers were binge drinkers and 88% of AI driving episodes involved binge drinkers. By drinking category, binge/nonheavy drinkers accounted for the largest percentage of AI drivers (49.4%), while binge/heavy drinkers accounted for the most episodes of AI driving (51.3%). The adjusted odds of AI driving were 20.1 (95% CI: 16.7, 24.3) for binge/heavy, 8.2 (6.9, 9.7) for binge/nonheavy, and 3.9 (2.4, 6.3) for nonbinge/heavy drinkers, respectively. There is a strong association between binge drinking and AI driving. Most AI drivers and almost half of all AI driving episodes involve persons who are not heavy drinkers (based on average daily consumption). Implementing effective interventions to prevent binge drinking could substantially reduce AI driving.

**Publication:** Alcoholism: Clinical and Experimental Research 2008;32(4): 637-44

**Authors:** Flowers N, Timothy N, Brewer R, Elder R, Shults R, Jiles R

### **Translating evidence into policy: Lessons learned from the case of lowering the legal blood alcohol limit for drivers.**

This case study examines the translation of evidence on the effectiveness of laws to reduce the blood alcohol concentration (BAC) of drivers into policy. It was reconstructed through discussions among individuals involved in the processes as well as a review of documentation and feedback on oral presentations. This case study suggests the value of: clearly outlining the relationships between health problems, interventions and outcomes; systematically assessing and synthesizing the evidence; using a credible group and rigorous process to assess the evidence; having an impartial body make specific policy recommendations on the basis of the evidence; being ready to capitalize in briefly opening policy windows; engaging key partners and stakeholders throughout the production and dissemination of the evidence and recommendations; undertaking personalized, targeted and compelling dissemination of the evidence and recommendations; involving multiple stakeholders in encouraging uptake and adherence of policy recommendations; and addressing sustainability. These lessons learned may help others working to translate evidence into policy.

**Publication:** Annals of Epidemiology 2010;20:412-20

**Authors:** Mercer SL, Sleet DA, Elder RA, Cole KH, RA Shults, Nichols JL

## **Teen Drivers**

### **Drivers aged 16 or 17 years involved in fatal crashes—United States, 2004-2008**

Over a five-year period, the annual number of 16- and 17-year-old drivers involved in fatal motor vehicle crashes decreased by 36 percent (from 2,230 in 2004 to 1,437 in 2008). The study also found that, across all U.S. states and the District of Columbia, death rates associated with these crashes varied widely, ranging from 9.7 per 100,000 (New York and New Jersey) to 59.6 per 100,000 (Wyoming). Graduated driver licensing policies (GDL), or teen driving laws, can be at least partially credited with the recent decline in the number of fatal crashes involving young drivers. These laws, which currently exist in 49 states and the District of Columbia, limit driving under high-risk conditions for newly-licensed drivers, such as driving at night and transporting other teen passengers.

**Publication:** Morbidity and Mortality Weekly Report (MMWR) 2010;59(41);1329-1334

**Authors:** Shults RA, Ali B

### **Graduated Driver Licensing research, 2007–present: A review and commentary**

The evolution of graduated licensing systems in the past 25 years has resulted in dramatic growth in research on this topic. The most recent summary reports have covered the period up to 2007. In this article, more recent and ongoing research is categorized, summarized, and discussed.

**Publication:** Journal of Safety Research 2010;41:77-84

**Authors:** Williams AF, Shults RA

## **The contribution of fatal crashes involving teens transporting teens**

*In Press*

**Publication:** Traffic Injury Prevention 2010 (in press)

**Authors:** Williams AF, Ali B, Shults RA.

## **Trends and subgroup differences in transportation-related injury risk and safety behaviors among US high school students, 1991-2007**

Seventy percent of unintentional injury-related fatalities--the leading cause of death among youth in the United States--are motor vehicle traffic related. This study examines trends in traffic safety issues among US high school students: helmet use while riding a bicycle, seat belt use as a passenger, driving when drinking alcohol, and riding in a car with a driver who had been drinking alcohol. Data from the 1991-2007 national Youth Risk Behavior Surveys (YRBS) were analyzed. From 1991 to 2007, the percentage of high school students who rarely or never wore bicycle helmets decreased from 96.2% to 85.1%; decreases were also seen in the percentage who never wore a seat belt (from 25.9% to 11.1%), rode with a driver who had been drinking alcohol (39.9-29.1%), and who drove when drinking alcohol (16.7-10.5%). Although the trends are encouraging, many students still put themselves at risk. Policy approaches (e.g., state or local laws or ordinances) complemented by community and school programs may be the best approach to reducing transportation-related injuries and fatalities.

**Publication:** Journal of School Health. 2009;79(4):169-76

**Authors:** Jones SE, Shults RA

## **Cross-Cutting**

### **Incidence and total lifetime costs of motor vehicle-related fatal and nonfatal injury by road user type, United States, 2005**

This article estimates the costs of motor vehicle-related fatal and nonfatal injuries in the United States in terms of medical care and lost productivity by road user type. Incidence and cost data for 2005 were derived from several data sources. Unit costs were calculated for medical spending and productivity losses for fatal and nonfatal injuries, and unit costs were multiplied by incidence to yield total costs. Injury incidence and costs are presented by age, sex, and road user type. Motor vehicle-related fatal and nonfatal injury costs exceeded \$99 billion. Costs associated with motor vehicle occupant fatal and nonfatal injuries accounted for 71 percent (\$70 billion) of all motor vehicle-related costs, followed by costs associated with motorcyclists (\$12 billion), pedestrians (\$10 billion), and pedalcyclists (\$5 billion). The substantial economic and societal costs associated with these injuries and deaths reinforce the need to implement evidence-based, cost-effective strategies. Evidence-based strategies that target increasing seat belt use, increasing child safety seat use, increasing motorcyclist and pedalcyclist helmet use, and decreasing alcohol-impaired driving are available.

**Publication:** Traffic Injury Prevention 2010;11(4):353-360

**Authors:** Naumann RB, Dellinger AM, Zaloshnja E, Lawrence BA, Miller TR

## **Work-related Road Safety**

### **Occupational highway transportation deaths - United States, 2003-2008**

Highway transportation crashes are the leading cause of fatal injuries in the United States for both workers and the general population. To assess trends and help guide the prevention of occupational highway transportation deaths, CDC analyzed data from the Census of Fatal Occupational Injuries (CFOI) for 2003-2008. Workers at highest risk of a fatal work-related crash were employed in truck

transportation (19.6 deaths per 100,000 workers), logging (11.7), petroleum products wholesaling (8.6), and waste management (8.5). The rate was 0.94 per 100,000 workers across all industries. Fatally-injured workers were most often occupants of tractor-trailers (35.2%), automobiles (17.2%), or pickup trucks (15.1%). Employer commitment to road safety at the highest levels of management and a comprehensive, integrated approach to safety management are the widely-accepted “best-practice” approach to preventing work-related crashes. Employer policies and employer-led changes in work practices can mitigate modifiable behavioral and environmental risk factors such as time pressures, work stress, fatigue, distracted driving, and non-use of safety belts.

**Publication:** Morbidity and Mortality Weekly Report 2011;60(16):497-502

**Authors:** Green MK, Harrison R, Leinenkugel K, Nguyen CB, Towle M, Schoonover T, Bunn T, Northwood J, Pratt SG, Myers JR